EUROPE 1992 AND CANADA'S SOFTWARE INDUSTRY

1992

CANADA EUROPE

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AND
CANADA'S SOFTWARE INDUSTRY

THE SOFTWARE MARKET IN THE UNITED KINGDOM

A Report Prepared by Ovum Ltd.

for

External Affairs and International Trade Canada

November 1991

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FROM THE GOVERNMENT OF CANADA

External Affairs and International Trade Canada (EAITC) is pleased to offer the Canadian software industry, as part of the Going Global trade strategy, this comprehensive study on market opportunities in the European Community, resulting from the Europe 1992 initiative and the possible means by which Canadian firms can capitalize on them. This study on the U.K. software market is part of a series of software market studies in the European Community.

Europe 1992 is happening now. The European Community's ambitious Single Market program has already dramatically changed the way Europeans are doing business. The process is irreversible; the pace is rapid and accelerating. If Canadian businesses are to profit from the opportunities that this enormous market will bring, they must be well-informed.

After the recent completion of a series of sectoral studies entitled *1992 Implications of a Single European Market*, EAITC conducted a consultative process which included government departments, the provinces and our European embassies to determine which subsectors should be the focus of further study. The result was the selection of the ocean industry, environmental industries, software, telecommunications products and services and value-added wood products. All of these studies will be published during the Fall of 1991 and into the Spring of 1992.

We also have tangible programs to introduce you to the European market. These are well-publicized through our CanadExport publications. Our trade officers in the European Community Division of EAITC and at the International Trade Centres in each province would be pleased to respond to your specific questions. Take advantage of these programs. They have been established to benefit you.

Publications that are currently available from the series *1992 Implications of a Single European Market* include: Agriculture and Food Products; Telecommunications and Computers; Automotive Industry; Minerals and Metals; Forest Products; Defence, Aerospace and Transportation; Specialty Chemical Products, New Materials, Pharmaceuticals and Biotechnology; Industrial Products and Services; Financial Services; Fisheries Products; and Professional and Consulting Services — Law and Accounting. Other reports include European Economic and Monetary Union; Company Law; Competition Policy; Standards; Freight Forwarding; 1992 and Related Issues; Intellectual Property; and Moving into Europe — Strategic Partnering.

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1. INTRODUCTION

1.1 Background

Following the publication of a series of sectoral reports on the implications of the Single European Market on Canada's trading, investment and technology interests, External Affairs and International Trade Canada (EAITC) is now focussing on sub-sectors of Canadian industry for which market opportunities have been identified in the European Community. This study, commissioned from Ovum in cooperation with the Canadian High Commission in London, is the first study commissioned by EAITC; it is designed to cover in greater detail the trade ramifications specific to the software sub-sector. It is not intended to be a complete guide for every company, but it should stimulate thought, provide some guidelines and indicate sources for further, more company-specific information.

All figures quoted are in Canadian dollars and based on the 1990 average exchange rate for the Canadian dollar against both Sterling and the US dollar, namely $C1 = £0.48 and $C1 = $US0.86 (Source: *The Economist*, June 29, 1991). The sales figures quoted in table 9.2 have been converted from ECUs (European Currency Units) at the rate of 1 ECU = £0.70 and $C1 = £0.48.

1.2 The United Kingdom Software Industry

Broadly speaking, the software industry in the United Kingdom is made up of a large number (many hundreds) of small businesses, many of them in niche markets, and a small number of much larger companies offering a much wider range of software products and services.

The software industry can be divided into two distinct areas: software products and software services. The total offering from any one supplier, however, will frequently contain elements of both. The market for software products is estimated to be about twice that for software services and is growing faster as the trend towards standardisation continues. Ovum estimates that the total computing services revenue of UK companiesin 1990 was about $C4 billion, excluding the systems software revenues of computer manufacturers.

Because of the international nature of the computer industry and, in particular, the common language which the UK shares with North America, much generic software can be used equally readily in both of these geographic areas. And, as is the case with hardware, much of the computer software in use in Britain — particularly software packages — comes from US-based companies. British suppliers of package software find it difficult to compete in this area because the home customer base in the UK domestic market is not large enough for launching a product. It is estimated that the UK supplies only about half of its own software needs, with the balance being made up by imports, and that the UK supplies about 3 per cent of the total world software market, of which it consumes about 5 per cent.

Although the UK GDP is only about 14.2 per cent of the total for all Western European countries (OECD figure, 1987), it is estimated that the UK software market is about 17 per cent of the total Western European software market.

While the UK market is broadly similar to the rest of Western Europe, there are some important differences:

- North American products can be sold more easily (see above).
- The British Telecomms environment is one of the most liberal in Western Europe.
- The CASE (Computer Aided Software Engineering) market is one of the most mature in Western Europe.

- The market for PC-based word processors and spreadsheets is more homogeneous. In the UK, a very large part of the word processor market is accounted for by leading US products, such as WordPerfect and Word, whereas in the rest of Europe the market is fragmented and local suppliers frequently have a substantial market share. Further, in the UK, Lotus 1-2-3 has achieved a dominance that it has not achieved elsewhere, because of the initial lack of versions in languages other than English.

Successful British software suppliers have typically concentrated on areas where their 'Britishness' is an advantage, such as defence where it is of strategic importance, accounting and payroll where their understanding of local legislation and practice is important, and sectors where the level of service is high and where their geographical proximity to the client is important. This orientation is obviously not conducive to developing export business. There are some notable exceptions, however, such as MicroFocus, with a 1990 turnover of $C96.7 million, which has developed what is effectively the world standard Cobol compiler for microcomputers; and Peterborough Software, with a 1990 turnover of $C40.6 million, which has exported its personnel software to the English-speaking world, particularly Australasia, with considerable success. Interestingly, Peterborough has not ventured into North America.

As the software industry becomes more international and as the Single European Market arrives in 1992, the British software industry is looking towards Europe as both a threat and an opportunity. The difference in local language makes exporting to Europe more of an undertaking than exporting to the English-speaking world.

There are four principal types of company active in the software industry:

- **Hardware manufacturers, who supply systems and application software for their own hardware platforms.** Typically, applications software accounts for about 10 to 15 per cent of a hardware supplier's software revenues, the balance arising from systems software.

  The main British-based hardware supplier is ICL, in which Fujitsu of Japan has taken a controlling interest. ICL had a 1990 turnover of $C3358 million, about one quarter of which was derived from software and another quarter from services. ICL has evolved over the years from the combination of various smaller companies, most importantly International Computers and Tabulators (ICT) and English Electric Computers. ICL has always supplied various ranges of proprietary systems, for which it supplied both systems and applications software but, like many other manufacturers, it is now moving towards open systems and also sees a greater role for itself as a systems integrator. ICL is expanding into Europe, and in mid-1991 acquired Nokia Data, the Scandinavian hardware supplier.

- **Software product companies, who supply either systems products such as compilers or teleprocessing monitors, or applications products such as accounting and payroll.** In the latter area there are many active small companies. The most significant supplier of payroll software is Peterborough Software. In the accounting field, there are many suppliers, but the market for accounting software on personal computers is dominated by Pegasus and Sage.

- **Services companies, who supply a total service to a client.** This usually involves writing custom software, and may include other services, such as training. Frequently, the custom software includes software product kernels that have been developed by the software services company for this purpose. Two of the most notable companies in this area are SD-Scicon (acquired in mid-August 1991 by EDS of the US after an acrimonious battle) with a 1990 turnover of $C552 million, of which about 15 per cent was attributable to software products; and Logica, with a 1990 turnover of $C390 million, about 10 per cent of which is estimated to be attributable to software products. There is a very large number of smaller total-service companies, ranging down to one-person firms.

- **Value-added resellers, who resell computer hardware to a client together with other system components, including software.** Some of the software products and software services companies are active in this area, together with many hundreds of specialist companies, typically providing turnkey solutions to their clients.

For the reasons given above, most software imported into the UK comes from North America, and most of it is generic and systems software. Some of the main suppliers are:

- the computer manufacturers, principally IBM, Digital, Unisys and Bull;
- suppliers of software only, such as Computer Associates, Pansophic, Oracle, Ask, and Informix.

Canadian companies wishing to enter the British market must be aware of the difference between markets where a substantial level of service is required, and those where packaged products with a lower level of service can easily be sold. In entering high service level markets, a substantial presence in the UK is required, so that the supplier appears to the customer to be completely British. In entering lower service level markets, a less substantial presence may be acceptable but suppliers must avoid areas where the competition is already strong and they have no clear competitive advantage.

2. THE EUROPEAN CONTEXT

2.1 The Single European Market and the Computer Industry

The Single European Market, or SEM, is the objective of a package of reforms to the workings of the European Community. These reforms are all intended to come into force by December 31, 1992. The drive to raise awareness of the programme and stimulate action to implement it has focused on this target date, and the phrase "Europe 1992" has come to identify the whole package. Taken as a whole, "Europe 1992" will put Europe even higher on the list of priorities in any plans for international expansion by Canadian companies.

Tariff barriers to trade between the 12 countries of the European Community have already been eliminated. The SEM programme concentrates on removing the non-tariff barriers and pursuing the fundamental principles of liberalisation, harmonisation and cross-border cooperation. The programme is based on an agenda of 312 proposals set out in a 1985 White Paper prepared by the European Commission, and made Community law by the *Single European Act* of 1987. It is intended to create a single market "in which the free movement of goods, persons, services and capital is ensured".

The coming of the SEM will affect the computer industry on two levels: through its effects on the general economic environment and through specific changes to the way the industry itself does business. SEM initiatives that have a major effect on the information technology industry include public procurement policies, the deregulation of telecommunications, the convergence of standards, software protection, and research and development.

2.2 Changing the Economic Environment

The changes that the SEM will make to the general economic environment have been widely discussed. In general, the SEM will encourage the growth of more multinational companies within Europe, with cross-border mergers and the creation of Europe-wide sales and distribution networks. It will reduce the distinctions between national markets and lead to more uniform product ranges and price levels throughout the Community.

But it is important to recognise that "1992" will not make Europe anywhere nearly as uniform as the US, where giant corporations dominate most branches of industry and commerce with continent-wide brands and products. There will still be big differences between Europe's national and regional markets, for reasons of language, culture, geography and simple inertia. Nor will all companies respond to the opportunity by setting up Europe-wide networks of companies. One effect of 1992 will be to make it easier to serve the whole of Europe from one or two national bases, and many companies will pursue this route, particularly the medium-sized and smaller ones.

Canadian companies entering European markets will have to address these changes. They will need to work towards providing the products and support networks that can meet Europe-wide needs. Only the very biggest will be able to do this by having sales and support people on the ground in every national and regional market. The rest will have to achieve it by making alliances or by developing the techniques for supporting different markets from a single centre. In many cases, the UK will offer the best starting point for building a multinational network or the best single centre for serving different markets.

2.3 Public Procurement Policies

Purchasing by governments and other public bodies accounts for about 15 per cent of the Community's gross domestic product. In the past many European governments have used this purchasing power to support indigenous computer companies. This has done much to set the pattern of the European computer industry, where the leading European companies — Siemens, Bull, Olivetti, ICL — are strong in their home markets but generally weak outside them. Meanwhile, only the leading American companies have built up a truly international capability in Europe.

This approach to public procurement has been outlawed by the SEM. Purchases by governments and public bodies are now supposed to reflect fair competition, not national identity. This policy is being enforced by a series of Directives that require public bodies to adopt open tendering procedures and provide for remedies against discrimination. These provisions are being extended to apply to utilities in

public ownership, including water, energy, transport and telecommunications undertakings, and to services as well as supplies.

These measures are already having an impact on the computer industry. Bull, in France, was one of the biggest beneficiaries of the old approach, and the heavy losses it suffered in 1990-91 were partly due to the effects of the change. The new environment gives Canadian companies the opportunity to leverage the strengths they have developed in the open, competitive markets of North America and compete on price, service and technical excellence.

2.4 Deregulation of Telecommunications

The European Commission is pursuing an action programme to liberalise the telecommunications regime in Europe and open markets to new entrants. New developments that specifically affect the computer industry include free markets in the provision of value-added services and, from December 1992, basic data services; open procurement of hardware and software supplies by the PTTs; and the development of Europe-wide broadband communications services. Taken together, these steps towards "Open Network Provision" (ONP) create opportunities to supply new types of communications services.

The implementation of ONP is necessarily a slow process. To seize any of the opportunities for providing new communications services, Canadian companies will probably need to ally themselves with big companies that already have an established position in European markets. But these and other changes in European telecommunications are creating a big demand for computer and communications hardware, software and services. Again, this offers many attractive opportunities for Canadian companies who can use the technology and marketing skills they have already acquired in the more deregulated markets of North America.

2.5 Harmonisation of Standards

The existence of different national standards has been one of the biggest non-tariff barriers to international trade within the Community. Accordingly, harmonisation of standards is one of the main objectives of the "Europe 1992" programme.

In the computer area, this has meant a drive for adoption of Unix and other open systems standards. In February 1987, the European Commission adopted a decision that requires public purchasers to specify open systems standards when purchasing IT systems. This means that, with a few exceptions, all public sector purchases with a value over 100,000 ECU (about £70,000) should conform to available open systems standards — basically the Posix interface standards and the X/Open specifications.

These policies have accelerated the move towards Unix in the European computer market. The leading European computer suppliers have all shifted the emphasis of their product lines away from proprietary operating systems and towards Unix. US and Japanese vendors also see Unix as the vehicle for growth in the European market after 1992. The Unix market, being open, offers a low barrier to entry for new suppliers. Equally, it promises to be highly competitive in both price and standards of service.

2.6 Software Protection

Another objective of the SEM is uniform protection of intellectual property rights throughout the Community. One effect of this will be generally stronger protection for software property rights. The measures are set out in the so-called "Software Directive", due to be formally adopted in May 1991. Roughly speaking the Directive will extend throughout the Community the high level of protection that software already enjoys in countries such as the UK. It will generally improve the commercial environment for companies selling software products in Europe. It also provides specific rights for users who need to interface between different programs.

But the Software Directive is a controversial measure, and its opponents — who include important sections of the Commission itself — believe it will create difficulties for new entrants to software markets. They claim it will actually handicap European companies in competing with the generally stronger American suppliers.

The Software Directive states that computer programs should be protected by the law of copyright, in the same way books are. But it also provides that customers should have the right to copy computer programs as much as necessary to make

legitimate use of them, including making backup copies and discovering the ideas and principles underlying the program.

The Directive also says customers should be given certain rights to "reverse engineer" programs, for example by obtaining the information needed "to achieve the interoperability of an independently created computer program with another program". At the same time, this information must not be used to develop, produce or sell another computer program that is substantially similar in its expression to the original one.

A strong body of opinion was pressing to have these reverse engineering rights extended. The European Committee for Interoperable Systems, which represents over 60 computer hardware and software suppliers, lobbied the European Parliament to get the Directive amended to allow the reverse engineering of hardware as well as software. Another proposed amendment would have allowed reverse engineering for maintenance of the program and not just for correcting errors. On the other hand, the big manufacturers, notably IBM, were against any extension of the reverse engineering provisions. In the end they won the day, and none of the amendments were accepted by the European Parliament.

Once formally adopted by the Council of Ministers, the Directive will require the Member States of the Community to bring the laws needed to comply with it into force before January 1, 1993.

2.7 Research and Development

There are two major programmes designed to encourage collaborative R&D in Europe: the Community's R&D Framework Programme and Eureka, which covers 19 European countries. Although both programmes originated before the SEM was launched, they are now being actively used as instruments of policy to promote the SEM objectives.

In April 1990, the Commission approved its third R&D Framework Programme, running from 1990 to 1994. It involves 5,700 million ECU (about £4,000 million) of community funding, with by far the largest share — 2221 million ECU or £1530 million — going to the Esprit and Race programmes on research in information and communications technologies. These programmes are concerned with pre-competitive research, particularly research leading to the development of common standards. Half the funding usually comes from the European Commission and the other half from the participants; projects usually have to involve cooperation between different countries, and between industrial and academic researchers.

The Eureka programme is more market centred, and is concerned with producing high-tech goods and services that can compete successfully worldwide. It is expected to involve a total investment of over £5,000 million, a large proportion in IT-related areas, although it covers the whole spectrum of advanced technology.

Officially, both these programmes are open to any company registered in the countries they cover, no matter where their ultimate ownership lies. In practice, there can be considerable resistance to participation by companies owned outside Europe, particularly if they are in high-profile roles, such as the leadership of a project. The attempt to exclude ICL from Esprit projects when it was bought by Fujitsu provides an example. But the barriers can be overcome and, indeed, they should not be so high for Canadian companies, which are not considered such threatening competitors as the Americans or the Japanese.

Once the barriers are overcome, there can be considerable benefits from participation in these programmes. They help to build alliances and demonstrate commitment to the European IT industry, as well as providing technological returns.

3. CASE AND OBJECT-ORIENTED PROGRAMMING MARKETS

3.1 Market Characteristics

The UK market for software products for CASE (Computer Aided Software Engineering) and object-oriented programming languages and tools was some $C133.3 million in 1990 (Source: Ovum's Software Europe and reports on the CASE and object-oriented markets). This figure includes:

- front-end CASE products for the information systems market. This is the biggest category, accounting for about half of total sales. Such products support analysis and design functions;
- front-end CASE products for the real-time (or technical) market. This market is much smaller — about 6 per cent of the UK CASE and object-oriented programming market;
- integrated CASE (I-CASE) products for the information systems market. These products cover several elements in the software development process: the front end and the back end, or functions such as project management that affect the whole lifecycle. These products account for some 36 per cent of the market;
- object-oriented languages and tools, such as Smalltalk and C++. These account for the rest of the total market.

Individual products can cover more than one of the first three categories. For example, ADW from Ernst and Young provides both front end and I-CASE functions. Each of the CASE markets will grow rapidly, with a compound annual growth rate of at least 25 per cent (net of inflation) until 1996. Real-time CASE tools will grow slightly more because they are starting from a low base.

Application development products, or fourth-generation languages (4GLs), are covered separately in Chapter 4. The Canadian company Cognos is a major supplier in this sector, with its Powerhouse 4GL.

Platforms include PCs and workstations linked by LANs, and mainframes. Increasingly, CASE tools are provided on PCs and workstations, and even data repositories are being moved down to LANs.

Distribution channels for CASE and object-oriented programming products vary. The UK adopted CASE early and has a number of native suppliers. For suppliers based outside the UK, there are three basic options for distributing CASE tools:

- a subsidiary,
- an independent distributor,
- a computer systems supplier.

Most of the large distributors of CASE tools in the UK prefer to distribute through subsidiaries, because of the control this gives them. Of 32 CASE suppliers active in the UK last summer, four were based in the UK and 17 were using local subsidiaries.

3.2 Suppliers

There is considerable supplier activity in the UK, which has one of the most mature CASE markets in the world. Only Scandinavia and the Netherlands are as advanced. The high level of activity in the UK comes about partly because of a tradition of using methodologies in software development. Several innovative suppliers are based in the UK,

- James Martin and LBMS, for example.

Suppliers tend to fall into the following categories:

- systems companies, which sell project development services and associated tools, such as Logica;
- consultancies associated with the big accountancy companies, such as Andersen Consulting and Ernst and Young;
- methodology consultants, such as LBMS;

- established software product suppliers, such as Oracle;
- start-ups selling software products for CASE and, to a lesser extent, object-oriented systems.

Systems companies and consultancies linked to the accountancies tend to focus on development projects and their associated products. Methodology consultants tend to concentrate on methodology consulting and related semi-custom products. The software product companies combine products with some methodology work, while CASE start-ups focus on software products.

Table 3.1 summarises the leading CASE products in the UK.

The object-oriented programming market is at a much earlier stage, with a number of small specialist suppliers selling mainly services. Table 3.2 lists some of the suppliers providing object-oriented programming products and services in the UK. Most are small, with fewer than 20 staff involved in the area. A few import products. Smalltalk Express resells the Smalltalk product, for example. Some systems vendors, such as ICL, are interested in object-oriented systems and have joined the Object Management Group. The UK is not a leader in this sector, however, and there is little sense of the market being driven by either suppliers or users.

3.3 Customers

Both CASE and object-oriented programming tools are used by large companies in a variety of sectors. Government, oil companies, banks and utilities — anywhere where large systems are developed — are interested in CASE. Few large UK customers are now without CASE activities. The same customers tend to be interested in OOP, though at a lower level of activity. The Object Interest Group — an informal customer association — has several large companies in its membership.

UK customers are more enthusiastic about methodologies and formal methods than many. For example, a survey of US and European development sites in 1989 found that some 33 per cent of UK development sites use analysis techniques, compared with 28 per cent in France and only 17 per cent in the US. The UK government makes widespread use of SSADM, for example, and expects CASE tools to support it. Non-government customers use other methodologies such as Information Engineering.

Both CASE and OOP customers investigate the technology in pilot projects, with a view to expanding its use when its cost-effectiveness can be shown. Buying patterns in CASE are strongly influenced by the customer's starting point. If it has a favoured 4GL, it may choose other distinct 'point' products that fit around that. Whenever possible, customers are better off choosing an integrated CASE system.

TABLE 3.1

Leading CASE vendors and products in the UK (estimates)

Position	Supplier	Product
1	IEW/KnowledgeWare	ADW
2	James Martin Assoc./Texas Instruments	IEF
3	Softlab	Maestro
4	Oracle	Oracle
5	LBMS	Systems Engineer
6	Excelerator	Excelerator
7=	Cadre	Teamwork
7=	Andersen Consulting	Foundation
8=	IDE	Software Through Pictures
8=	Verilog	Verilog

TABLE 3.2

Some UK object-oriented systems suppliers

Company	Products
AI Corp Ltd	KBMS
Architecture Projects Management Ltd	ANSAware
Artificial Intelligence International Ltd	
Harlequin Ltd	Lispworks
Integral Solutions Ltd	
Ipsys	Ipsys HOOD Toolset, HOOD Reverse Engineer
Jensen & Partners (UK) Ltd	TopSpeed Pascal, C++, Modula-2
KBSL	Hoist, Foosa, Food
Logic Programming Associates	Prolog++, MacObject
Object Designers Ltd	
Procyon Research Ltd	Procyon Common Lisp
Smalltalk Express Ltd	Goodies 99
Tenet Systems Ltd	GSQL, GMAP
Zortech Ltd	Zortech C++

3.4 Implications for Canadian Companies

In both the CASE and OOP sectors, there are few explicit barriers to overseas suppliers. Customers are happy to buy software products that are not produced locally. In both cases, these products may be associated with services, which places extra demands on the supplier's support system.

The UK Case market raises the following issues for overseas suppliers:

- It is large for the size of the country, advanced and strongly contested. The size of the market can be expected to increase as large customers currently evaluating CASE products start to use them on a wider scale.
- Other suppliers and customers are knowledgeable and sophisticated. Any suppliers joining this market need to provide excellent support.
- Sector-related methods may need to be supported, notably in government.

The OOP market is different in size and nature:

- It is still small, and not advanced compared to the US and some other European countries. It is still being driven from the US, with little local impetus.
- The market is crowded with small consultancies but, so far, the basic languages available seem to meet immediate customer needs.
- It is still early for selling to end user organisations. The best current opportunities probably lie in selling to value-added resellers in areas like CAD, where object-oriented languages and tools can be embedded in their products. These opportunities are not specific to the UK, however.

4. 4GLS AND DBMS

4.1 Market Characteristics

A fourth-generation language (4GL) is a user-friendly programming language. A database management system (DBMS) is a system for defining, controlling, storing and retrieving data that is held in databases.

The UK market for 4GLs and DBMSs was $C629.2 million in 1990. This figure includes:

- revenues from the three hardware platform categories (*ie* personal computers, minicomputers and mainframes);
- maintenance revenues for minicomputers and mainframe databases.

The figure is broken down as follows:

- $C135.4m for 4GLs,
- $C493.8m for databases.

The market for 4GLs and databases is expected to grow by an average of 28 per cent per annum over the next three years.

4GLs and DBMSs will have the most impact in the mid-range systems market, which has so far been slow. The emergence of open systems and the increased number of relational database products on mid-range systems will boost this market. In contrast, the mainframe market will reach its peak by 1995 as virtually all installations will have a 4GL installed on them. The PC market will continue to grow slowly and steadily.

The increasing use of Unix operating systems is leading to changes in both the hardware and software market. The cost of database software is expected to fall dramatically when users move from database-oriented strategies to application-based ones. When applications become the strategic issue, 4GLs will assume a far greater importance. Already, 4GLs that currently support access to many databases and operate over multiple hardware platforms are gaining a greater proportion of the market share. This shift in market direction is making 4GL vendors more concerned about having a product that is able to connect applications to a wide range of Relational Database Management Systems (RDBMSs) and other software components, such as windows and graphics.

The main avenues of distribution for 4GLs and DBMSs are through UK subsidiaries of the major suppliers. Companies such as Ingres have a series of partnership agreements to extend their product range whilst Cognos, the Canadian supplier, relies on direct sales with the use of telesales in the UK for its lower-valued products. Value-added resellers (VARs) are also an important avenue of distribution for these products.

4.2 Suppliers

The main suppliers of 4GLs and DBMSs are Oracle, Ingres, Informix and Cognos. A list of leading suppliers and their products can be found in Table 4.1.

Suppliers are divided into two groups: those who supply a 4GL with a DBMS and those who supply the products separately. Oracle and Ingres are examples of companies that sell a complete DBMS/4GL package whilst Cognos and Informix sell the products separately.

IBM is rapidly becoming the market leader for mainframes with its product DB2. Amongst independent vendors, Oracle is the market leader with its product, Oracle RDBMS. Its UK revenues for the year ending May 31, 1990 were £68m, most off which came from the sale of Oracle. As the database market matures, the company is moving into applications to run with its database system.

The UK systems supplier ICL provides a 4GL, Quickbuild, for use with its DBMS, IDMS, and also for use with third-party CASE tools. The company is hoping to integrate Quickbuild with the Ingres database in the near future. Ingres currently runs on all of ICL's hardware platforms.

Uniface 4GL, a new Dutch product from Uniface, is rapidly gaining market share, frequently at the expense of Cognos. It is database independent and can run with Oracle and Ingres DBMSs.

TABLE 4.1

Leading suppliers of 4GL and DBMS products

Supplier	Product
Cincom	Mantis
Cognos	Powerhouse
IBM	DB2
ICL	Quickbuild
Information Builders	Focus
Informix	Informix
Ingres	Ingres
McDonnell Douglas	Pro IV
Mimer Software	Mimer
Oracle	Oracle
Progress Software	Progress
SAS Institute	SAS
Software AG	Natural
Sybase	Fastbuild
Uniface	Uniface

4.3 Customers

Every company that uses a database is a potential customer for 4GLs and DBMSs. In general, large companies in the commercial sector were early users of 4GLs, while developers in the technical sector tend to be suspicious that 4GLs will produce inefficient code. Otherwise, both products are used across all sectors.

Oracle has found that UK users are more interested in solutions-based applications than their European counterparts. They prefer not to buy packaged applications but instead are interested in software with consultancy that will tackle specific problems that have arisen. Oracle UK is seeking to exploit this interest. Its services revenues form a higher proportion of its turnover than at other Oracle subsidiaries.

4.4 Implications for Canadian Companies

One of the major suppliers in the market is a Canadian company, Cognos, with its Powerhouse 4GL product. It runs on DEC, Hewlett-Packard and Data General mid-range systems. The company operates through subsidiaries in the UK and Europe. The UK is the company's best market and its main focus for future development and marketing is on the mid-range computer. However, Cognos will face increasing competition as this market moves towards Unix.

The worldwide market for 4GLs and DBMSs is homogenised and there are no discernable UK characteristics. In the UK, there appears to be no preference for local suppliers. The majority of companies are based in the US.

The growth of object-oriented database management systems (OODBMSs) is threatening the traditional RDBMS market. RDBMSs are good at handling simple data items but users now want to be able to store images, voice and video, and to define their own data types and functions. OODBMSs can provide support for these data types and existing RDBMS vendors must enhance their products to meet user needs or find their market dwindling.

It is forecast that the OODBMS market will account for revenues of $C2.8bn (Source: Ovum's report *Databases for Objects* — the market opportunity) in Europe by 1995, approximately half of the total DBMS market. There are no native UK OODBMS suppliers at present. This is an area of possible opportunity for Canadian companies.

5. GEOGRAPHICAL INFORMATION SYSTEMS (GIS)

5.1 Market Characteristics

Software products for Geographical Information Systems (GIS) are attracting considerable attention as part of a developing market with great potential for future growth. In this summary we have interpreted GIS as systems that use image processing to store and manipulate geographic data. This data combines spatial information (such as maps) with record-based data (such as the address of a householder).

The UK market for GIS software products is approximately $C29m and growing. This compares with a worldwide market for GIS — including software, hardware and services — of some $C712 million in 1989. Worldwide market revenues for GIS software sales were estimated at over $244 million in 1989 — 45 per cent higher than in 1988. These software product sales are shifting to workstation platforms.

The UK has seen rapidly-growing interest in GIS. ESRI has about 500 installations of ARC/Info, for example. Many customers are investigating the technology with a view to investing if it proves appropriate (see section 5.3).

Distribution paths vary, rather as they do in the CASE market. Intergraph, McDonnell Douglas and IBM sell directly in the UK. ESRI, for example, sells its ARC/Info product through a distributor, Doric. Customers are commonly interested in getting support for large database undertakings and so, might be disinclined to buy a shrink-wrapped product with little prospect of support.

5.2 Suppliers

GIS suppliers tend to fall into three groups:

- computer systems vendors with complete offerings for GIS, such as IBM with GIFAS, or Prime with System 9;
- suppliers of workstation-based systems in the image or graphics processing area, where GIS have developed from work in CAD or similar systems. Intergraph and Computervision fall into this category;
- companies where GIS is the main focus of their product offerings. These are often smaller companies or organisations, such as ESRI, that developed GIS tools for their own use and are now reselling them.

The GIS area also attracts small service companies, from one-person-bands upwards. This is to be expected from a new area where large organisations, such as public utilities, are considering investment.

The UK market contains international and local suppliers, with international market leaders Intergraph and ESRI figuring largely.

5.3 Customers

The combination of spatial and record-based information provided by GIS is attractive to several customer segments:

- local and central government bodies, which want to monitor and plan for activities linked to geographical areas;
- utilities and transport organisations, which want to integrate large amounts of information and carry out modelling processes, such as traffic routing and maintenance planning;
- oil companies, which want to combine maps and record-based data with complex calculations and processing routines;
- environmental bodies, which see GIS as a useful way of monitoring the effects of changes on the environment;
- marketing specialists, who are interested in the prospect of geographically ordered market research information.

Special conditions in the UK affect the first three groups.

Local government interest in GIS has mushroomed because of changes in regulations. These include the introduction of competitive tendering processes and the complexity of applying for central government

grants under new regulations. The way in which local government raises money from its residents has recently been changed and is about to be changed again. Local government needs more flexible information systems to cope with these changes and sees GIS as a promising part of such systems. GIS are also needed to help local government assess the virtues of different maintenance tenders, for example. Councils feel the need to have better management of their information bases, so as to respond better to changing political processes and pressures. Some 80 per cent of information held by local authorities is geographically based, so GIS are crucial in managing it. Over 100 local councils are currently piloting GIS.

There are broader-based government GIS activities. In Northern Ireland all the utilities, councils and government departments have banded together to produce an integrated GIS for the whole province. Across the UK, central government wants to be able to link geographical data to other information to support changes in health service and education. The current government is keen to increase local accountability and funding for these services and needs supporting information systems.

On a European scale, in 1990 the European Environment Agency (EEA) was founded. This has fostered the development of a common GIS used by some 500 EC scientists. The European Commission's information market policy actions committee thinks that GIS might play a strategic role in developing the information services market. In October 1990, it held a workshop in Brighton in the UK to discuss standards and the idea of a European Transfer Format for geographic information. UK organisations such as the Ordnance Survey government mapping body and the Automobile Association are participating directly in an EC joint venture to build a vehicle navigation database.

Utilities face similar pressures as those confronting local government, in proving that they are managing their resources efficiently. Recent privatisations in areas such as water and electricity have given utilities the incentive and the money with which to improve their geographical information management. Some utilities, such as water and gas boards, have to support considerable maintenance programmes in keeping up aging pipes and pumping equipment. They see GIS as a way of better organising such maintenance and of providing audit trails to show that maintenance has been properly carried out.

The UK oil sector is fairly buoyant and, unlike US oil companies, Europeans are large purchasers of software products, in preference to developing software in house. Niches such as geophysical mapping offer GIS opportunities. The UK provides a better opportunity than other European countries like France and Germany because it has about twice as many potential users in major oil companies and oil industry consultancies.

The Association for Geographic Information (AGI) reflects the high level of interest from utilities and local government in the UK. It was founded in 1989 and has 500 members. It includes 24 computer systems suppliers, individuals and other organisations. Most of the user organisations are utilities and local government bodies and this disposition is reflected in GIS purchasers. Recent GIS sales include McDonnell Douglas at Sandwell Council, and Intergraph at Yorkshire Electricity.

5.4 Implications for Canadian Companies

The UK market for GIS software products is fairly open, with overseas suppliers figuring largely. There are few explicit barriers to overseas suppliers but some customers may expect long-term assistance in developing information bases, and so will require associated services. Overseas suppliers will also be at a disadvantage where value-added GIS are concerned. It is difficult for them to identify and support GIS applications and packages that contain public domain information relating to the UK.

Nonetheless the UK offers better opportunities than comparable European countries among newly privatised utilities, government (especially local government) and the oil industry. Government and utility opportunities are partly the result of local political changes (described above). Overseas suppliers should try to understand these when selling to the relevant sectors.

Another factor in the UK GIS market is the Ordnance Survey (OS) cartographic system. OS maps, which cover the whole of the UK, have now been digitised

and are marketed as Superplans. The digitised data of OS Superplans is used by some GIS suppliers as a core for more specialised packages. Another country-wide data source, the 1981 Census, has been linked to OS Superplans in some applications. The UK government is now conducting the 1991 Census. When those data are available there may be opportunities to combine it with spatial information in GIS products.

Other constraints on the GIS market mainly relate to data collection and validation bottlenecks. Some utilities, for example, have only very old, unreliable data on the locations of pipes and other equipment. Because the UK industrialised fairly early, this information can be a up to 100 years old. The utilities cannot leap in with widespread GIS purchases without first entering accurate data, which is a slow process.

6. GRAPHICS AND IMAGE PROCESSING

6.1 Market Characteristics

Graphics and image processing products cover a wide area. They include computer-aided design (CAD), presentation graphics, and document image processing (DIP) systems. DIP is the transfer of paper documents to a computer system. Graphical user interfaces and associated tool kits could also be grouped into this market sector. The related areas of multimedia and geographic information systems (GIS) use graphics and image processing components.

One of the most promising markets in this area is image processing systems. This market shows the potential for considerable growth. There are three basic forms of image processing systems:

- standalone PC-based systems;
- multi-user systems that use a client server architecture such as Unix (e.g. Filenet and Philips Megadoc);
- multi-user host-based systems which use a mainframe or minicomputer (e.g. Wang IMS and IBM Imageplus).

The European market for these systems and the associated consultancy is forecast to increase from $C219m at the end of 1989 to $C1115m by the end of 1994. The UK market was approximately $C31m at the end of 1989 and is forecast to increase to nearly $C167m in 1994. The UK market for PC-based presentation graphics packages for the same period of time is more established and stable. It will grow from $C108m to $C148m.

Departmental multi-user systems will remain the largest component of the image processing market because they offer an increasingly favourable price/performance ratio over mainframe systems. Single user PC-based systems offer no advantage except as standalone systems in small establishments. Sales have reflected this trend, as most installations sold to date have been multi-user departmental systems for use with one specific application.

Application areas to date have been predominantly in financial and insurance industries plus some areas of government. Typical applications are correspondence processing and service requests.

The technologies for the diverse range of components of graphics and image processing systems have been in existence for some time, but only recently have they been sufficiently developed to make products at mass market prices possible. Most components derive from other product areas, for example:

- scanners based on the technology of facsimile machines,
- optical discs.

6.2 Suppliers

The majority of CAD suppliers are US companies such as Mentor Graphics. Suppliers of presentation graphics and graphical user interface products tend to be PC software companies such as Microsoft and Quarterdeck, which again come mainly from the US.

The majority of suppliers of graphics and image processing products are US companies with certain exceptions, like Philips and Olivetti. These companies sell through subsidiaries and distributors in the UK. There are very few UK-based companies in the market.

Table 6.1 lists UK suppliers of image processing applications. There are no major UK suppliers in the graphics markets.

The image processing market is currently at its peak in terms of the number of suppliers in the UK as well as the rest of the world. From now on there will be a shake-out in the industry as the stronger suppliers assert their position and the weaker ones abandon the image processing market. The general trend will be for computer system suppliers to enhance their position as image becomes just another data type. This does not mean that all other types of suppliers will be squeezed out, just the weaker ones in each category.

There are a number of UK suppliers in related niche markets. For example, IXI Ltd of Cambridge provides tools for X Window System development. Intelligent Environments of Richmond, Surrey, supplies a product for developing a Common User Access interface specification to IBM's SAA. And,

across the Irish sea, Glockenspiel, a Dublin-based company, provides tools for developing different graphical user interfaces.

6.3 Customers

Users of CAD systems are based in technical areas such as the electronics industry. Customers for presentation graphics and graphical user interfaces tend to be in the business markets. Users of graphics systems span the spectrum of markets and industries.

The main users of image processing systems have typically been large financial and insurance companies as well as government departments, all of which are paper intensive. These sectors currently account for over 50 per cent of the image processing systems currently installed in the UK. However, the technology is now spreading to all industrial sectors and is being used for applications such as workflow management and transaction processing. Table 6.2 lists a number of current UK users of graphics and image processing.

TABLE 6.1

UK suppliers of image processing applications

Supplier	Application
Applied Telematics Group Ltd	Viewnet
Bradford University Software Services Ltd	Simpleplot
Bradly Associates Ltd	Gino-F
ICL	OfficePower
Isograph Ltd	Isovu
Logica	Lucid
Racal Imaging System	REOS
Xionics	Xionics Mark II

TABLE 6.2

UK users of image processing applications

Company	Current Application
Amerada Hess	Oil rig construction records
Britannia Building Society	Mortgage processing
British Telecom	Telephone customer contracts
HS Library Services	Press cuttings
Local authorities	Community Charge administration
National Westminster Bank	Card issuing services
Swift	Customer correspondence
Trustees Savings Bank	Unit Trust correspondence

Good results from initial installations plus technical enhancements will encourage organizations to spread the use of image processing to other applications. Many companies, particularly in finance, insurance and services, will be obliged to use the technology to maintain their competitive positions, since the benefits of using the technology are so substantial.

The choice of supplier in the UK has largely been dictated by what was available at the time. The earliest image processing systems were supplied by systems integrators who brought in components and custom wrote the software. In the mid-1980s standalone systems were available from Olivetti and Philips. Some of the systems required the supplier to write the software but today the development tools have been sufficiently improved that software can be developed by user organizations, a third party or the supplier.

Users have to make a basic decision as to whether they install individual departmental image processing systems, a corporate host-based system or a hybrid using both.

6.4 Implications for Canadian Companies

The CAD and presentation graphics markets are well contested but they are growing worldwide as well as in the UK. The UK market for graphics and image processing systems is dominated by US companies. There are few UK based companies and no preference for native suppliers. The market is close to saturation for image processing systems and also graphics. It would therefore be unwise for Canadian companies to enter this market. However, the emergence of multimedia opens up opportunities in this area. The European multimedia market is forecast to be worth $C13.8bn by 1994. This figure is for hardware and the corresponding figure for software is $C3.7bn (Source: Inteco Corporation). Another possible niche market is graphical user interface toolkits. There is a reasonable level of UK activity (see Suppliers section on page 18) but considerable potential exists for suppliers of easy-to-use tools.

The market issues for the next five years for graphics and image processing centre around the development and agreement of standards. This is forecast to be the largest single constraint on the growth of the market and has to be resolved to enable the integration of image processing into mainstream data processing.

Suppliers and developers of both package and custom software need to develop the necessary skills to exploit image processing as a prime opportunity to expand existing markets. As well as offering substantial benefits to users, graphics and image processing is also fashionably 'green' in terms of the huge potential for reducing paper consumption and therefore highly desirable within the marketplace.

7. CONNECTIVITY AND NETWORKING APPLICATIONS

7.1 Market Characteristics

This section covers the market for software products to provide basic information transfer services between computer systems, including support for applications such as electronic mail and file transfer.

Most of the characteristics of the UK market are common to the European market as a whole. But the European market for such software products is different from that in North America, mainly because of the influence of OSI (Open Systems Interconnection). As a general consideration, the interest in and uptake of OSI has been much greater in Europe than in the US and indeed the UK has been at the forefront of many OSI developments. The rest of this subsection describes architectures including the OSI model and its relation to the market, including product types.

The market for communications software products has changed rapidly over the last five years. Prior to the emergence of OSI standards, it was dominated by proprietary products.

There are, therefore, two major sectors in the communications software market, although many suppliers worldwide are now viewing OSI as the strategic direction.

Proprietary Architectures

The two main proprietary architectures are IBM's SNA and DEC's DECNet. There is a considerable installed base of systems using each of these protocols throughout the world. Software supporting these architectures is provided by the companies themselves or through licences. This market is saturated and there is little potential for new companies to compete, in the UK or elsewhere.

Users are now increasingly demanding greater connectivity between their computer systems, which may be supplied by a variety of vendors, and this has led to an increased interest in standard protocols. In addition, the Commission of the European Communities (CEC) enacted a regulation, CEC 87/95, which made consideration of OSI protocols mandatory in all large (greater than 100,000 ECU — about $C146,000) public sector purchases in Europe.

OSI model, OSI Standards and OSI Profiles

The OSI model is an architecture for data communications. It defines seven layers of services that are typically needed in order to support communication between applications running on networked computer systems. Further details of the architecture are given in Table 7.1

Support for the lower two layers is usually provided in hardware. From the network layer, up through the model to the application layer, support is usually via software. An understanding of the basic framework of the model is important since most vendors use it when describing the type of functionality provided by specific software products.

Within each layer, the protocol definition permits various options to be implemented. Naturally, if two communicating systems utilize protocols in which a separate set of options are used then communication will not be possible. To prevent this from occurring, OSI profiles have been defined.

An OSI profile is derived for a particular industry sector and defines a set of the options within the OSI protocols which are to be used by companies within that sector. The most important profile in the UK is GOSIP (Government OSI Profile) which applies to public sector networking in the UK. There are also versions of GOSIP in Canada, the US and France, whilst Israel and Australia have adopted UK GOSIP.

Most significantly, GOSIP is used as a procurement specification. Whenever a public tender is issued, conformance to the appropriate section of the GOSIP profile will be mandated. This has had a significant effect on the development of the UK (and European) market for OSI, since the options included in GOSIP have been the first to be implemented by commercial software producers. The EPHOS (European Procurement Handbook for Open Systems) is being completed in 1991. It will include recommendations for OSI procurement on a Europe-wide basis.

The GOSIP profile divides the OSI model into two parts: GOSIP-A (covering the application, presentation and session layers) and GOSIP-T which covers the lower layers. The lower layers, hence GOSIP-T, are more hardware oriented and of less

TABLE 7.1

The OSI Model

The OSI layers are:

Physical	This specifies the physical transmission medium (e.g. wires, fibre-optic cables) which provides the physical connection to each networked computer.
Data Link	The data link layer is concerned with ensuring error free transmission between a networked system and the end of the local loop. Distances involved would typically not extend outside a building.
Network	This layer is concerned with routing information between local loops and thereby between remote computer systems.
Transport	The transport layer removes any errors introduced by the lower three layers.
Session	The session layer provides services associated with the management of sessions of interaction between applications, e.g. it provides a "checkpointing" mechanism to enable interrupted communication sessions to be resumed in an orderly fashion
Presentation	The presentation layer is concerned with the negotiation of common data encodings to be used between applications.
Application	At the application layer, there are a number of defined "Application Service Elements" which provide support for the applications that a network user would typically wish to use, e.g. file transfer, transaction processing, electronic mail, remote job entry and directory services.

interest to software companies. We therefore concentrate on the upper layers.

The application layer is of most interest to smaller, independent software suppliers. Protocol definitions at this layer are less tightly defined than at the other layers. There is, therefore, more scope for independent suppliers to Innovate and thereby to gain a competitive edge.

The most significant OSI protocols in the market place today are X.25, FTAM, X.400 and X.500, whilst network management (NM) remains a future growth area. Table 7.2 summarizes UK markets for OSI-compliant products in these categories. Table 7.2 also shows the "exclusion" market for OSI — that is, the total systems market from which a supplier is excluded because it does not support the relevant standard. These numbers translate into much smaller sales of actual software products. For example, sales of X.400 software products to UK commercial customers in 1991 will be about $C15.6 million. But it is not possible to transpose this ration directly onto the other sectors to get software product sales. Promising markets for software product suppliers include FTAM, X.400 and X.500, and network management. Table 7.3 shows major suppliers of these products in the UK.

FTAM (File Transfer, Access and Management) is a part of OSI and provides basic file transfer facilities between networked computer systems. It is the most commonly used and implemented application layer protocol. Very few implementations do, however, implement the entire functionality of FTAM. All the major US and European computer system vendors have products.

X.400 and X.500 are related CCITT recommendations for electronic mail and directory services respectively. Both are aligned with the OSI model and are included in the GOSIP profiles. Previous studies by Ovum predict that the market for X.400 will grow by a factor of five by 1994.

X.400 is also increasingly being used as a vehicle for EDI (Electronic Data Interchange), which promises to reduce the number of documents exchanged between companies and to replace them with electronic messages.

All the major computer companies have implementations of X.400 and X.500 but some of these are built upon a core developed by the smaller suppliers (e.g. Retix). Core services are enhanced through the addition of further software to integrate the product within the vendor's existing product families. The suppliers of products are essentially the same as for FTAM.

Network Management and Operating Systems

Network management systems are currently very fashionable. The market today is dominated by proprietary products. Important developments are, however, taking place in the standards bodies. Users are increasingly requiring standard network management systems rather than the proliferation of proprietary products currently offered. The work of the OSI Network Management Forum is important in this respect and it will become increasingly significant as management protocols become defined.

Another category of networking software products, network operating systems, are primarily found in the PC market. They supplement the existing MS/DOS operating system to provide additional functionality required for networked operation. Most implement a client-server architecture where one PC is designated the server and stores the applications and data used by the users on their PC. Resource sharing (such as printer sharing) is also typically supported.

The UK and European position is similar to that in North America. At present, Novell Netware dominates the marketplace. Indeed, with IBM agreeing to support Netware it seems unlikely that any new players will gain a significant market share for some time. The product is available in two main commercial versions: Netware 2.2 and Netware 3.11. Netware 2.2 is aimed at the general office market, whereas Netware 3.11 offers greater facilities for connecting to external networks.

In addition, Novell also sells Portable Netware to OEMs, which can be ported to any 32bit computer system. Virtually all the major computer suppliers have taken licences for Netware and about 900,000 licences have been sold worldwide (Source: Ovum's *Software Europe*). This probably represents 70 per cent of the total market for LAN operating systems.

The only serious competition to Netware is from Microsoft's LAN Manager product and from Banyan's Vines product. LAN Manager is targeted at the same market as Netware but has not succeeded in achieving a major market share. Vines was developed for the Unix market and has a specific appeal to the TCP/IP user community. The TCP/IP protocol is a networking protocol incorporated into the Unix operating system. It is not a part of the OSI architecture but it performs functions associated with the network and transport layers. Ultimately, it will be phased out as OSI takes over the market.

7.2 Suppliers

The market is dominated by the mainstream computer suppliers, who are developing products to support users of their own proprietary network architectures. Most of these are US companies. Their own home market is heavily influenced by proprietary products and OSI has a smaller impact than it does in Europe.

The European market is quite different, since OSI is becoming the dominant architecture. Most major US and European companies have protocol suites — at least for the GOSIP profile.

In what were initially niche markets, such as X.400 and X.500, smaller companies and software houses such as Retix (from the US) and Logica (from the UK), have been able to establish a lead with their products. At present, many large companies have been prepared to buy core software from the smaller

TABLE 7.2

User uptake of OSI protocols

(The figures represent the percentage of users adopting the protocols.)

	1991	1992	1995
X.500	0	20	52
X.400	18	61	82
FTAM	12	48	66
VT	n/a	20	41
TP	n/a	20	39
NM	0	29	70

The total market for each protocol in the UK (in $Cbillion) is forecast as:

	1991	1995
X.400	5.2	43.8
X.500	0.42	33.3
FTAM	1.5	43.8
VT	0.21	4.2
TP	n/a	2.1
NM	0.42	13.5

TABLE 7.3

Major providers of FTAM, X.400 and X.500 products

The following companies were the first to announce products conforming to the X.400 and X.500 recommendations:

- Retix
- Marben
- DEC
- Logica
- HP
- ICL

All the major computer companies now supply products for FTAM, X.400 and X.500.

suppliers and adapt it to suit the remainder of their product line. Ultimately, the larger suppliers will, however, develop their own products.

Smaller US suppliers, such as Novell, have achieved a dominance in the PC networking marketplace. Most of the major vendors have not addressed this market or have struck alliances with the smaller suppliers.

In Europe, the telecommunication operators, such as British Telecom, have not had a major impact in the communications software market. British Telecom has concentrated on the hardware side of the business, which is closer to their core operations. In particular, the current interest in structured cabling has provided a ready made market.

7.3 Customers

The UK market for communications software products is similar to that of Europe as a whole. There are, however, major difference between the US and European markets. These differences are mainly related to the introduction of standardization through European law, such as EEC directive 87/95. In Europe, hence in the UK, OSI is becoming essential rather than just desirable as it is in the US.

Looking at specific market segments, PC LAN usage is becoming ubiquitous with no industry sector being dominant. Even relatively small offices (with fewer than 50 people) can now consider it cost-effective to use a LAN on the grounds of resource sharing and access to shared data storage.

Users of the OSI protocols, however, tend to be large companies that have a need to exchange information across many sites or across multiple computing platforms. For them, the cost savings of not having to use expensive protocol translation equipment can justify a move to OSI even is there is — as can happen — some loss of functionality.

The major applications used by companies over networks are file transfer and electronic mail, hence the large growth expected in FTAM and X.400 markets.

7.4 Implications for Canadian Companies

The market for most communication software products in Europe is extremely competitive. Major competition comes from the computer companies rather than from the telephone companies.

The increasing move towards the adoption of standards has resulted in great downward pressure on the prices of most software. It will not be possible for small suppliers to compete.

Exceptions occur only when new standards are developed and the smaller suppliers can quickly move in to capture a niche market. Example markets are X.400 and X.500 where Retix (US), Marben (France) and Logica (UK) have produced products. These are still evolving markets where Canadian software companies could generate successful products.

Network management is forecast to grow considerably in the next few years. This would be a worthwhile market to investigate. The impact of standardization will ensure that products produced for the UK market will also sell to Europe.

In the general PC networking market, it is unlikely that any new companies could capture a significant market share, since US companies have attained a dominant position.

8. UTILITIES

8.1 Market Characteristics

Utilities are defined as products that help the user run, enhance, create or analyse other programmes, languages, operating systems and equipment. They include:

- file and storage management systems,
- security management,
- performance management,
- system testing.

The UK market for utilities was $C56m in 1990 and is forecast to increase to $C77m by 1994. It is a small market, which will stay small, but it is a significant niche for many small suppliers.

Minicomputers account for the largest share of the market, currently 77 per cent of the total market for utilities, and with increasing use in the UK of Unix, this percentage will rise. However, it is the PC market, currently the smallest, that is the fastest growing of all the sectors.

Suppliers of utilities for mainframes tend to be the developers of those machines, for example IBM and ICL. Third-party vendors of utility applications are more likely to supply tools for the mid-range and PC markets. Products are supplied through subsidiaries and distributors and users rent rather than buy the applications in certain areas (see Macro 4 below).

8.2 Suppliers

The supplier market is broadly divided into three levels: the large system venders such as IBM, the large- and medium-sized software vendors such as Computer Associates, and the niche suppliers such as S & S Enterprises. The large suppliers are US-based with subsidiaries or distributors in the UK.

Table 8.1 lists a number of UK suppliers of utility applications.

TABLE 8.1

Some UK suppliers of utilities

Supplier	Product
ALLM Systems & Marketing	Super-Stack
Ansible Information Ltd	APE 90 Ansible Apricot Emulator
CCS Computer Services	Diskette Manager
Clares Micro Supplies	Brom+
Future Software Ltd	Tuner/38
Gordon & Gotch Computer Gp	B20SYLK Symbolic Link to Multiplan for B20
IMI Computing Ltd	DISOSS Administrator
Macro 4 plc	CMAP, Lockmaster, Synchro, VPAC
MSS International Ltd	Flatery
Primary Systems Ltd	Browser
Sierra Systems	DiskZap
Synon Ltd	Synon Standards for IBM Systems 38 and AS/400
S & S Enterprises Ltd	Wide range of utilities products including: Alias, APE Drive, Autokey, Amsfix, Brainstorm, Boot, Video Control, Touch, Treesize, QBeep
Traveling Software Inc.	Battery Watch

The UK companies tend to be small concerns with typically fewer than 50 employees and revenues of less than $C6m. They concentrate on specific products; for example, Ansible Information sells an Emulator for the Apricot, a range of personal computers that has been very successful in the UK business market. The largest of these companies in terms of size and revenues are IMI Computing, Synon (which supplies utilities for mid-range IBM systems) and Macro 4.

Macro 4, a UK-based company, is the only significant European-based supplier of utilities for IBM mainframes. The company prefers to rent its software rather than sell product licences. This has proved to be very successful, yielding high profit levels. The company uses subsidiaries and distributors to sell its products throughout Europe and the US. Most of its sales activity is telesales-based, which keeps the company's costs down.

Some systems vendors have developed "intelligent" utilities packages. For example, Digital and ICL have both built knowledge-based performance tuning systems, which have proved successful.

8.3 Customers

The market for utilities is not sector based. The very nature of utilities means they are used by most companies that use computer systems. There is a great deal of interest amongst users in the UK for Unix and distributed systems. However, Unix systems are hard to manage and require a large number of utility applications. Performance management is also a significant issue in the UK for large users of applications such as computer-aided design (CAD).

8.4 Implications for Canadian Companies

The utilities market is small and there are a large number of suppliers ranging from IBM to small two-person operations. There are areas of opportunity for Canadian companies. These include utilities for the Unix market, which is growing rapidly amongst medium range UK companies, and the distributed systems markets which is gaining importance in the UK (although not as quickly as in the US). The UK is also more inclined towards open systems than the US and UK customers therefore do not tend to be tied to one vendor for all their application requirements.

9. CONCLUSIONS

9.1 Summary

The Single European Market

The Single European Market will come into force by 31 December 1992. Major changes will be seen in:

- the economic environment,
- public procurement policies,
- deregulation of telecommunications,
- harmonization of standards,
- software protection,
- research and development.

Many changes in these areas are already under way.

CASE (Computer Aided Software Engineering) and object-oriented programming markets

- The UK market for CASE and object-oriented programming languages and tools was some $C74 million in 1990.
- The UK is one of the most mature CASE markets in Europe.
- The object-oriented programming market is at an earlier stage.
- UK customers are more enthusiastic about methodologies and formal methods than many.

The 4GL (Fourth Generation Language) and DBMS (Database Management System) markets

- The UK market for 4GLs and DBMS was $C629 million in 1990.
- This market is forecast to grow by an average of 28 per cent per annum over the next three years.
- The mainframe market will reach saturation by 1995.
- The Canadian supplier Cognos is a significant supplier to this market.

Geographical Information Systems (GIS) markets

- The UK market for GIS software products is estimated at approximately $C29 million.
- There is strong growth in the UK public sector demand for GIS.

Graphics and Image Processing Systems markets

- The UK market for these products was estimated at $C31 million at the end or 1989.
- Departmental multi-user systems will remain the largest component of this market.
- The main users have been large financial and insurance companies, together with the government sector, but use is now spreading to all industrial sectors.

Connectivity and networking applications markets

- This market differs from that in North America because of the importance of OSI.
- OSI protocols are mandatory in all large public-sector purchases.
- In the PC networking area, the market is dominated by Novell Netware, as it is in North America.
- The OSI market is dominated by the large hardware platform vendors.

Utilities markets

- The UK market for utilities was $C56 million in 1990, and is forecast to grow to $C77 million by 1994.
- Mini-computers account for the largest share of the market.

- Suppliers of utilities for mainframes tend to be the developers of the machines.

- The utilities market is small, and there are a large number of suppliers.

9.2 Distributing Software in the UK and Europe

Introduction

As both customers and vendors of software products have to become more global in outlook, so the pressure to distribute a software product worldwide increases. Despite the imminent arrival of 1992, distributing software products in Europe remains a complex issue. It is still necessary to establish separate channels for each of the 20 countries (or so, depending upon your definition of Europe). Each of these countries has its own characteristics, ranging from its language to its local competition.

It is this fragmented nature of the European market that has make it difficult for European product developers to succeed on a world scale. The European (and world) software product market remains dominated by US-based vendors who benefit from the large, homogeneous US market. Sixty per cent of the sales of the top 40 software product vendors in Europe come from US-based companies.

This summary examines some of the issues of distributing software products in the UK and Europe. It covers software products sold using a personal sales force. It does not examine the separate issues of distributing low-cost software products through dealers. This analysis is based on previous consulting assignments and research undertaken by Ovum.

Choosing a Distribution Route

There are two main options for distributing software in a particular European country:

TABLE 9.1

COMPARISON OF CHANNELS

Distribution via subsidiary

Advantages

- High level of control.
- Focused activity — not selling anything else.

Disadvantages

- Expensive, both in funding and management attention.
- Time consuming to establish.

Distribution via independent distributor

Advantages

- Quick access to existing sales and marketing infrastructure.
- Distributor has existing customer base.
- Early feedback on product and local market.

Disadvantages

- Distributor is selling other products.
- Distributor has a short-term view.
- Difficult to exercise control or consistency.

- set up a subsidiary,
- appoint an independent distributor (or "agent").

The main pros and cons of these are summarized in table 9.1.

There are two other minor options:

- via a computer systems vendor,
- via a value-added reseller (VAR).

In practice, the distinctions between these categories are often blurred. For example, a distributor may be a joint venture between the developer and a local distribution company.

Subsidiary Versus Distributor

Setting up a subsidiary is nearly always the best solution in the long term. The main benefits are:

- a high level of control over activities in the country,
- a single focus on selling the product not diluted by other activities.

However, the disadvantages of subsidiaries are:

- the substantial cost,
- the time required to establish a presence.

These disadvantages are overwhelming for most small companies, who do not have the funds to establish a subsidiary and who need to build a customer base as quickly as possible. Therefore, the preferred route for small companies is to appoint distributors until they have the resources to fund and manage subsidiaries.

Table 9.2 shows the main routes used by all of the companies profiled in Ovum's *Software Europe*. The companies are ordered by European sales of software products. The table indicates the countries where their headquarters and European headquarters are located, and the countries in which they operate a subsidiary for distribution. These countries are ordered, left to right by total size.

Not surprisingly, the table confirms that larger companies use subsidiaries. The table also shows that companies establish subsidiaries in the larger markets first. For smaller companies, locating subsidiaries close to early clients is a good principle to follow.

TABLE 9.2

LOCATION OF EUROPEAN SUBSIDIARIES OF SOFTWARE COMPANIES SURVEYED BY OVUM'S SOFTWARE EUROPE (RANKED BY SALES) AS OF APRIL 1991

Company	Sales ($ C million)	World HQ	European HQ	Location of European Subsidiaries									
				Germany	*France*	*UK*	*Italy*	*Spain*	*Neth.*	*Sweden*	*Belgium*	*Switz.*	*Austria*
IBM	4345	USA	France	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Siemens	1097	Germany		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICL	732	UK	UK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nixdorf	688	Germany		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Digital	512	USA	Switzerland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Computer Associates	512	USA	USA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Nokia Data (now ICL-owned)	439	Sweden		Yes	Yes	Yes		Yes	Yes	Yes		Yes	
Bull	437	France		Yes	Yes	Yes	Yes						
Microsoft	373	USA	France	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Unisys	347	USA	UK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oracle	288	USA	UK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Hewlett-Packard	234	USA	Switzerland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Software AG	21	Germany		Yes	Yes	Yes		Yes	Yes	Yes	Yes		Yes
Prime	190	USA	Fr./Ger/UK./Belg.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
McDonnell Douglas	167	USA	UK	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CGI	180	France			Yes	Yes	Yes	Yes	Yes		Yes	Yes	
SAP	180	Germany	Switzerland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lotus	167	USA	UK	Yes	Yes	Yes	Yes	Yes	Yes	Yes			

Company	Sales ($ C million)	World HQ	European HQ	Location of European Subsidiaries									
				Germany	*France*	*UK*	*Italy*	*Spain*	*Neth.*	*Sweden*	*Belgium*	*Suitz.*	*Austria*
Intergraph	132	USA	NL	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Santa Cruz Operation	129	USA	UK	Yes	Yes	Yes	Yes						
Serma	121	UK	UK	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
SG2	104	France			Yes						Yes		
Ashton-Tate *	102	USA	UK	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Groupe Concept	101	France		Yes	Yes		Yes	Yes	Yes	Yes			
Cap Gemini Sogeti	99	France		Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Cincom	92	USA	UK/Fr/Ger	Yes	Yes					Yes	Yes	Yes	
Ingres	83	USA	UK	Yes	Yes	Yes			Yes				
Information Builders	83	USA	UK		Yes	Yes		Yes	Yes		Yes	Yes	
GSI	79	France		Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Informik	76	USA	UK	Yes	Yes	Yes		Yes	Yes	Yes			
SAS Institute	75	USA	Germany	Yes	Yes	Yes	Yes		Yes	Yes	Yes		
Andersen Consulting	59	USA	UK	Yes	Yes	Yes	Yes	Yes			Yes		
Pansophic	57	USA	UK	Yes	Yes	Yes	Yes		Yes		Yes	Yes	Yes
SD-Scicon *	54	UK		Yes	Yes	Yes	Yes		Yes		Yes		
Softlab	53	Germany		Yes		Yes	Yes	Yes			Yes	Yes	
Cognos	51	Canada	UK	Yes	Yes	Yes		Yes	Yes	Yes	Yes		
Apple	51	USA	France	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Hoskyns	48	UK		Yes		Yes			Yes		Yes		
Data General	7	USA	France	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CCS	41	Spain						Yes					

Company	Sales ($ C million)	World HQ	European HQ	Location of European Subsidiaries									
				Germany	*France*	*UK*	*Italy*	*Spain*	*Neth.*	*Sweden*	*Belgium*	*Suitz.*	*Austria*
Dun & Bradstreet Software	40	USA	UK	Yes	Yes	Yes	Yes	Yes	Yes		Yes		
KHK Software	32	Germany		Yes								Yes	Yes
Peterborough Software	31	UK				Yes							
Ernst & Young	31	USA	Belgium	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Telesoft	29	Sweden								Yes	Yes		
Software Sciences +	28	UK		Yes		Yes			Yes				
Digital Research *	25	USA	UK	Yes	Yes	Yes							
Micro Focus	25	UK		Yes		Yes							
Ibermatica	25	Spain						Yes					
Manager Software Products	20	USA	UK	Yes		Yes	Yes		Yes	Yes		Yes	Yes
Macro 4	19	UK		Yes	Yes	Yes	Yes		Yes		Yes	Yes	
Logic Control	19	Espagne						Yes					
Synon	19	UK				Yes							
James Martin	18	UK		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Sesri	15	France			Yes			Yes			Yes		
Borland *	15	USA	France	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Pegasus	15	UK				Yes							
Alays	12	France			Yes	Yes				Yes			
LBMS	11	UK		Yes			Yes	Yes	Yes	Yes		Yes	
Sybase	10	USA	UK	Yes	Yes	Yes							
Inas Paghe	10	Italy					Yes						

Company	Sales ($ C million)	World HQ	European HQ	Location of European Subsidiaries									
				Germany	*France*	*UK*	*Italy*	*Spain*	*Neth.*	*Sweden*	*Belgium*	*Suitz.*	*Austria*
Cadre	9	USA	Switzerland	Yes	Yes	Yes						Yes	
GEI	9	Germany		Yes									
Systematica	7	UK				Yes							
Verilog	6	France		Yes	Yes	Yes							
Westmount Technology	6	NL							Yes				
IDE	5	USA	France		Yes	Yes							
DOC International	5	Denmark				Yes							
Symbolics	5	USA	USA	Yes		Yes	Yes						
Graphael	4	France		Yes	Yes	Yes							
ISA	3	Germany		Yes									
Findel	n/a	Italy											
ACT Financial Systems	n/a	UK											
Open Software Foundation	n/a	USA	Germany	Yes	Yes								
X/Open	n/a	UK				Yes							

Notes:

1 Companies marked thus * were the subject of acquisitions/mergers at the time of writing, which may affect their ranking once completed.
2 + Software Sciences is now known as Data Sciences following a management buyout from its former parent Thorn-EMI.
3 The European countries are listed in descending order of market size from left to right, i.e. Germany is the largest, Austria the smallest.

The benefits of using an independent distributor are:

- quick access to an existing sales and marketing infrastructure,
- access to an existing customer base,
- feedback on product and local market before committing serious resources.

The distributor may be selling complementary products.

Therefore, a distributor can provide cash flow and a customer base quickly with minimal investment. This can increase the value of the developer rapidly — important if it is planning to sell equity.

However, relying on an independent distributor is always uncertain, because:

- the distributor is almost always selling other products and services. Therefore the developer is competing for attention;
- the distributor has a short-term view. Agreements typically last for three years, so that there is always the temptation to take the easy sales (in particular, local subsidiaries of existing customers in other countries) and not to build for the longer term;
- it is difficult to ensure control and consistency.

Occasionally, things can go very badly wrong. There have been examples of distributors:

- who have entered into an agreement purely to prevent sales of a product in the distributor's country;
- who have been developing their own product (secretly), and who use the opportunity of distributing a future competitor's product to steal ideas and to build customer contacts.

A distributor will generally take between 30 and 70 per cent of the sale. A typical average is 50 per cent. The level set will depend upon the resources and added value applied to the exercise by the distributor.

For a private company, the choice of subsidiaries versus distributors may be influenced by the preferred exit strategy of the shareholders:

- for a company that aims to go public, a network of subsidiaries is generally preferable, because of the enhanced image of an international company;
- for a company that aims to sell out to a (larger) company in a similar business, distributors may be preferable, if the new parent already has an international network of its own. Most distribution agreements include a clause that invalidates them if ownership of supplier or distributor changes.

Other Distribution Routes

Distribution via a computer systems vendor (CSV) occurs in some cases. This may be desirable for the CSV when sales of hardware are highly dependent upon the particular software product, or when the software product fills an important gap in the CSV's own product range.

Distribution via a CSV offers the following benefits:

- endorsement of the product by a major player,
- access to a substantial sales and marketing infrastructure.

However, the disadvantages are that:

- the CSV is obviously more committed to its own product,
- the CSV has to be persuaded to provide adequate support,
- the CSV, like the independent distributor, has a short-term view; the product is often a gap-filler.

IBM's manoeuvres with AD/Cycle provide a good illustration. Initially, IBM did not have any products for the analysis and design "tiles" of the AD/Cycle framework. It distributed products from third parties, which gave a temporary boost to those products.

Now that IBM is beginning to launch its own products, its enthusiasm for these partners will wane.

(Much more frequent, of course, is the establishment of a range of joint marketing agreements between CSVs and independent software producers. However, this covers marketing only; the CSV does not distribute the product. Generally, the CSV's interest is in having as many third-party software products as possible available on its hardware platforms.)

Distribution via a value-added reseller (VAR) occurs when the VAR builds a product based on the developer's product — an accounting package built using a DBMS or 4GL for example. The original product may not be visible to the end customer, but these indirect sales are useful for building credibility and, of course, for the run-time royalty.

Choosing a Distributor

What features should a developer look for in a distributor? Ovum believes that the following factors are the key to successful software product distribution (see Table 9.3).

TABLE 9.3

Critical Success Factors for the Independent Distributor

- Commercial motivation
- Focus on product sales/experience of selling software products
- Existing complementary customer base/knowledge of market
- Ability to adapt product to local needs
- Good image

Commercial motivation seems obvious but, surprisingly, is regularly overlooked. For example, the distributor may impress the developer with its knowledge of and interest in the product. But the distributor's motivation may be just that: an interest.

Focus on product sales/experience of selling software products is vital. In general, companies with a services orientation (i.e. consultancy, systems development and integration) make poor vendors of software products. Their management, their structure, their sales staff and their accounting systems do not recognise what is required to sell products. Often, this kind of distributor will just sell a few copies to its existing clients. It may take on the distributorship primarily to generate new accounts for its service offerings. If the distributor is not already selling products successfully, then it will probably need to establish an autonomous division to be successful.

Existing complementary customer base/knowledge of market is self evident. The closer the distributor fits in this respect, the shorter will be the learning curve, and hence the time required to achieve the first sales.

The distributor must have the expertise required to adapt the product to local needs, if this is important.

Finally, the good image of a distributor in his local market will help the developer enormously in the long term.

The View from the Distributor

Distribution is a risky business. The joke goes (with some element of truth): too successful, and the developer wants to set up his own subsidiary; unsuccessful, and the developer wants to replace you.

To reduce both of these risks, the distributor has to distribute a variety of products so that it does not become too dependent on any particular one. This means that distributors are always on the lookout for new products to distribute, particularly when an agreement is nearing completion. This, in turn, means that distributors may start marketing competing products — to the obvious disadvantage of the developer. Often a deal is put together whereby the distributor "sells" the remainder of the agreement back to the developer, together with transfer of staff to help start a subsidiary. (Staff are generally more loyal to a product than to the distributor's company.) The distributor can exert a mild form of blackmail on the developer, by giving low support to the product and thereby giving it a bad name in the local market.

10. USEFUL CONTACTS

Given the dynamic nature of the software market, useful contacts are constantly changing and we recommend that the first point of co.ntact for the Canadian software company wishing to export to the UK, be the Canadian High Commission in London, whose address — together with other recommended contacts – is listed below:

Canadian High Commission
Commercial/Economic Division
Macdonald House
1 Grosvenor Square
London W1X 0AB
Tel: (011-44-71) 629-9492
Fax: (011-44-71) 409-1473
George Edwards — Commercial Officer

The High Commission can advise on specific opportunities in the UK for given software and provide relevant contacts and information.

Computing Services Association (CSA)
Hanover House
73-74 High Holborn
London WC1V 6LE
Tel: (011-44-71) 405-2171
Fax: (011-44-71) 404-4119
Tony Lewis — Membership Director

The CSA is the leading UK trade association covering the computer services industry, with over 300 members with revenues of $C6bn. It is the strongest association in Europe and a useful source of information.

Ovum Ltd
7 Rathbone Street
London W1P 1AF
Tel: (011-44-71) 255-2670
Fax: (011-44-71) 255-1995
Tim Johnson — Chairman

Ovum is a leading UK-based market researcher in Information Technology. As well as producing custom reports such as this, Ovum produces the monthly subscription *Software Europe* and other off-the-shelf studies.

Romtec plc
Hattori House
Vanwall Road
Maidenhead
Berks SL6 4UW
Tel: (011-44-628) 770077
Fax: (011-44-628) 785433
Dick Howe — Managing Consultant

Romtec is a UK-based market researcher in the Information Technology field with an emphasis on the personal computer market. It produces such distribution databases as the *UK VAR Directory, Top European Distributors* and *Benelux Distributor Directory* as well as undertaking custom research and consultancy assignments.

VNU Business Publications
VNU House
32-34 Broadwick Street
London W1A 2HG
Tel: (011-44-71) 439-4242
Fax: (011-44-71) 437-9638

VNU is the leading UK publisher of computer directories and magazines, including *Software Users Yearbook, PC Week* and *Computing.*

EMAP Business &
Computer Publications
34 Farringdon Lane
London EC1R 3AU
Tel: (011-44-71) 251-6222
Fax: (011-44-71) 490-0912

EMAP is the publisher of a range of computer publications, primarily aimed at the PC market, including *PC User*, *What Personal Computer* and *CADCAM*. An associate company organizes exhibitions & conferences.

Reed Business Publishing Group
Quadrant House
26 The Quadrant
Sutton
Surrey TW9 1DL
Tel: (011-44-81) 661-3500

Reed Business Publishing Group publishes a wide range of computer journals, including the UK edition of *PC Magazine*. An associate company organizes exhibitions and conferences including *Which Computer*.

Blenheim Online
Blenheim House
Ash Hill Drive
Pinner
Middx HA5 2AE
Tel: (011-44-81) 868-4466
Fax: (011-44-81) 868-5691

Blenheim Online are specialist organizers of Information Technology conferences and exhibitions, such as *Computers in the City* and *Computer Graphics*.

UniForum UK
9-11 EBC House
Richmond Station Buildings
Richmond-upon-Thames
Surrey TW9 2NA
Tel: (011-44-81) 332-0446
Fax: (011-44-81) 332-0448

UniForum is the independent, non-profit organisation funded by the UK computer community to promote and assist with the adoption of Open Systems by British business and government. It has 1,200 members and is affiliated with similar organisations around the world.

11. GLOSSARY

CAD	Computer-aided design
CAE	Common applications environment, a standard for open systems published by X/Open
CASE	Computer-aided software engineering, using computers to aid in the design and/or construction of software
DIP	Document image processing
DBMS	Database management system
EDI	Electronic data interchange, in the sense of interchange between enterprises
EPHOS	European procurement handbook on open systems
FTAM	File transfer, access and management, the OSI standard for file interchange across networks
GOSIP	Government OSI profile, a government standard for the procurement of OSI products
NM	Network management
OSI	Open systems interconnection, a set of open standards for the interconnection of systems
Posix	Portable operating system interface for computer environments, an industry standard for computer operating systems
RDBMS	Relational database management system
TP	Transaction processing
VT	Virtual terminal
X.25	A CCITT standard for packet-switched systems
X.400	A CCITT standard for electronic mail systems
X.500	A CCITT standard for electronic directory systems
X/Open	A body of computer vendors, established to promote common standards

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